

Peer-Reviewed Science on Radiation Health Effects Dispels ‘Tooth Fairy Project’

July 2006

Key Facts

■ For more than 30 years, a small group of scientists has claimed that low-level radiation can be linked to various forms of cancer and other ailments in populations living near nuclear power plants. The groups have attempted to use strontium-90, a substance easily traceable in the body, to show that radiation from nuclear power plants affects nearby residents.

■ In November 2003, the Radiation and Public Health Project (RPHP) claimed that a new study found strontium-90 to be 34 percent higher in baby teeth of children born after 1979 in three Pennsylvania counties than in the rest of the state. They claim this is evidence that radiation from nearby nuclear plants caused an increase in cancer rates in certain communities.

Scientifically-based reviews continually show these claims to be false. The claims of the “tooth fairy project” have not been supported by mainstream scientists, the majority of whom have accused RPHP of using “junk science” and manipulated data to support a pre-set agenda based on inciting fear in the public.

■ Most strontium-90 in the environment was produced by nuclear weapons testing during the Cold War. The amount of strontium-90 actually emitted by nuclear plants is so low that it must be measured at the plant site in order to be detectable.

■ After 30 years of allegations, none of the “tooth fairy project” claims has been substantiated by state and/or federal authorities. But during that time, the claims have been refuted or questioned by the National Institutes of Health (NIH), the National Cancer Institute, the U.S. Nuclear Regulatory Commission, the American Cancer Society, and state and local health officials.

Specious Claims About Strontium-90

For several decades, a small group of activists has tried to instill fear in the public that a substance called strontium-90 is evidence that low levels of radiation released from nuclear power plants causes cancer and other health problems in nearby residents. Since the claims first surfaced some 30 years ago, they continuously have been dismissed by mainstream scientists as scare tactics and “junk science,” contributing nothing to finding the real causes of

cancer. They are instead manipulations of the public by these groups without any basis in science. These studies are known as the “tooth fairy project.”

In November 2003, RPHP, the group that sponsors most of the strontium-90 claims, said a new study found strontium-90 to be 34 percent higher in baby teeth of children born after 1979 in three Pennsylvania counties than in the rest of the state.

These counties are near the Limerick nuclear power plant and within 80 miles of 11 other reactors. RPHP claims the timing is significant because the first Limerick reactor began operation in 1984 and the second in 1989. RPHP claims the plants are the reason strontium-90 levels in nearby counties were found to be above state and national averages.

RPHP claimed an earlier study in Suffolk County, N.Y., near Brookhaven Nuclear Laboratory, showed a “nearly identical” increase in incidences of childhood cancer and increases in the strontium-90 found in baby teeth. The group claimed that levels of strontium-90 are 50 percent higher in the teeth of childhood cancer victims than in teeth collected from non-cancer patients. Based on these



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findings, RPHP claimed a connection between radiation and cancer in the county. RPHP made these claims after collecting 95 teeth and testing 61.

But RPHP’s claims do not stand up to scientific scrutiny. The U.S. Environmental Protection Agency operates a nationwide network for monitoring radioactivity in the environment. The agency’s measurements indicate that although strontium-90 levels have declined since atmospheric nuclear weapons testing ended, the radioisotope still is detected in the environment, especially in milk, so you would expect to find it in baby teeth.

John Matuszek, former director of the New York State Department of Health’s Radiological Sciences Laboratory, was hired by Suffolk County to evaluate RPHP’s research proposal there. He said the proposed sample sizes were too small and that detectors used in the study were incapable of differentiating between strontium-90 and naturally occurring radioactive compounds, and that error margins they claimed were implausible. Matuszek said RPHP’s conclusions “have nothing to do with cancer cases.”

“What they do is what’s popularly referred to as ‘junk science,’” said Dr. Joshua Lipsman, the health commissioner in Westchester County, N.Y., where the Indian Point nuclear plant is located.

“We found a number of scientific error, both in measurement

and process, in their proposals,” Lipsman said.

The claims regularly surface in areas where nuclear plants are pursuing an extended operating license—a process that requires an environmental review by the NRC. Most recently, these claims surfaced in connection with the environmental review accompanying the renewal of the operating license for the Turkey Point nuclear plant in Florida. In 2000, RPHP released a study titled “Strontium-90 in Deciduous Teeth as a Factor in Early Childhood Cancer,” alleging an increase in cancer incidence resulting from strontium-90 releases from nuclear facilities, evidenced by elevated levels of the substance in children’s teeth.

The NRC, in its 2002 impact statement for Turkey Point, determined that the RPHP study does not present any new information not already dismissed in numerous earlier strontium-90 studies released by the group. The staff also determined that strontium-90 found in deciduous teeth in the vicinity did not result from releases from Turkey Point and that there is no increased incidence of cancer in the area due to Turkey Point operation.

What Is Strontium-90?

Strontium-90 is produced only by atomic bombs, nuclear submarines and nuclear reactors. It is a good element to study because it has a long half-life, 28.7 years, and is easy to test.

Strontium-90 is chemically similar to calcium, following

calcium through the food chain and appearing in human bone and teeth. Thus, strontium-90 found in baby teeth has been transported through the milk of dairy cattle that have eaten vegetation containing the material. Strontium-90 is found only in baby teeth because the adult body rejects the material in favor of calcium.

Like all radioactive materials, strontium-90 can be measured precisely at extremely low levels. The U.S. Department of Energy and its predecessor agencies have monitored strontium-90 levels since the early 1950s. Radiation safety programs at nuclear power plants monitor and analyze air and water releases—including specific analysis for strontium-90—using state-of-the-art sampling techniques and laboratory analysis. These monitoring programs—which are subject to strict oversight by the NRC and states—provide the government with accurate information that is published on a regular basis and available to the public.

The multiple safety barriers and constant monitoring used at nuclear power plants ensure any strontium-90 releases are so small that they would be undetectable in comparison with the amount of strontium-90 already in the environment from weapons testing. These levels are well below government limits. No credible scientific study has shown that the levels of strontium found in the environment pose a health risk. It is misleading and reckless to equate the mere presence of a radioactive isotope—many of

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which are produced naturally by the environment and by the human body—with adverse health effects. Claims of a link between strontium-90 and breast cancer are not supported by sound science.

A Legacy of Questionable Science and False Claims

The latest round of claims actually is based on a twisted variation of scientific studies on baby teeth during the early days of the Cold War. Scientists began to complain that the government was regularly testing atomic bombs domestically without knowing the effects it would have on the public. The campaign to collect baby teeth started in 1959 at Washington University in St. Louis. Strontium-90 was chosen as a proxy for the dozens of slow-to-decay radioactive compounds in nuclear fallout because it was easy to detect in testing.

There are three sources of strontium-90 in the environment: fallout from nuclear weapons testing, releases from the Chernobyl accident in the Ukraine and minute releases from nuclear power reactors. Even today, strontium-90 from weapons testing fallout is by far the largest source.

The validity of the tooth study has been questioned by the scientific community. In 1964, scientist John Harley, of the U.S. Atomic Energy Commission’s Health and Safety Laboratory, questioned the use of teeth to determine health effects from fallout during weapons testing. Harley wrote: “Among

the available monitoring systems, the use of deciduous teeth or other teeth does not offer any advantage.”

A 1970 American Academy of Pediatrics committee also criticized the hypothesis linking fallout from nuclear weapons tests to health effects. It called the tooth fairy study conclusions “unfounded and unsubstantiated.” The original study eventually was abandoned.

RPHP was founded in 1985 and acquired the baby teeth left over from the Cold War study. RPHP began altering the original research purpose of examining the teeth and instead used them as a means to seek the closure of nuclear power plants.

A 1990 NIH study, “Cancer in Populations Living Near Nuclear Facilities,” evaluated cancer deaths occurring between 1950 and 1984 in 107 counties with nuclear installations and certain adjacent counties in the United States. The peer-reviewed study found:

- “Overall, and for specific groups of nuclear installations, there was no evidence to suggest that cancer mortality in counties with nuclear facilities was higher than, or was increasing in time faster than, the mortality experience of similar counties in the United States.
- “This study has found no suggestion that nuclear facilities may be linked causally with excess deaths from leukemia or from other cancers

in populations living nearby.”

A 1991 National Cancer Institute study also is at odds with the RPHP claims, finding no general increased risk of death from cancer for people living near 62 reactors.

Zdenek Hrubec, a biostatistician who worked on the 1991 National Cancer Institute study, said it is difficult to imagine a case where reactors caused an increase in cancer that was hidden in the statistics. “You’d have to postulate that there was a deficit of smokers or industrial pollutants in the same places where there were nuclear reactors.”

In 1999, RPHP announced preliminary findings of a study claiming a greater risk for women in some counties in Long Island, N.Y., of developing breast cancer, based on evidence gathered in its baby tooth study. This study focused on the Millstone, Oyster Creek and Indian Point nuclear plants. The NIH’s National Cancer Institute conducted a study to investigate the incidence of breast cancer on Long Island. The study concluded that established risk factors—age, family history and genetic markers—appear to be the main reason for the breast cancer clusters in the Northeast and Mid-Atlantic.¹

Those involved with the “tooth fairy project” claimed they found high levels of strontium-90 in baby teeth near the Turkey Point

¹ “Report to the U.S. Congress: The Long Island Breast Cancer Study,” Department of Health and Human Services, November 2004.

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and St. Lucie plants in Florida. However, the Florida Department of Health monitors radiation levels at locations around the state’s nuclear plants and has found no emissions that would harm the citizens of Florida.

In 2001, the American Cancer Society concluded that although reports about cancer case “clusters” in some communities have raised public concern, studies have shown that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population. Likewise, there is no new evidence that links strontium-90 with increases in breast cancer, prostate cancer or childhood cancer rates.

“Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants,” the American Cancer Society said.

Scientists Debunk ‘Tooth Fairy’ Claim

The following is a compilation of the results of numerous studies that repeatedly have addressed and debunked RPHP’s allegations linking low-level radiation and cancer.

American Cancer Society, New Jersey Division, Sept. 26, 1997.

“Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants. Although reports about cancer case clusters in such

communities have raised public concern, studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population.”

Stephen V. Musolino, et al., comments on “Breast Cancer: Evidence for a Relation to Fission Products in the Diet,” International Journal of Health Services, 1995, 25(3), 475-480.

“For over three decades, Ernest Sternglass (recently joined by Jay Gould) has made more than 50 similar allegations connecting radioactivity from fallout from nuclear weapons testing and, subsequently, from nuclear reactors, with increased infant mortality, a decline in SAT scores, and an increase in leukemia mortality. Lately, they have begun to make claims of a correlation between breast cancer incidence and releases of radioactivity from nuclear power plants.

“In the past, over 50 critical examinations of these types of allegations by numerous reputable scientists have found the Sternglass methodology scientifically deficient and consisting principally of selected evidence. Furthermore, as an example of the numerous formal refutations of the claims by Sternglass and/or Gould, the Minnesota Energy Agency concluded that ‘with respect to Dr. Sternglass, both his methodology and his conclusions have been repeatedly rejected in numerous scientific and technical studies, including evaluations done by the United

States Environmental Protection Agency, the National Cancer Institute, the National Academy of Sciences and by many independent scientists.’”

Mark S. Rapoport, M.D., M.P.H., Westchester County Commissioner of Health, letter to the editor, North County News, Nov. 22, 1995.

“I am writing in response to a letter to the editor citing a new study by Greenpeace, which alleges a correlation between breast cancer rates and proximity to nuclear power plants in the Great Lakes Basin. In 1993, a similar allegation was made by the same authors about breast cancer rates in this area and was totally discredited by local, state and national health officials.”

“Fact vs. Fear,” letter to the editor, Minneapolis Star Tribune, May 6, 1995.

“Sternglass’ findings were surprising, as they did not square with other known studies. The (Minnesota) Department of Health quite properly chose to investigate. It performed a much more rigorous analysis of cancer data than did Sternglass, considering not just breast cancer mortality rates but far more numerous data on cancer occurrences. In addition, it studied types of cancers known to be sensitive to radiation exposure: bone and thyroid cancer and leukemia. In all cases, the study found cancer rates ‘statistically indistinguishable’ between the 10 counties near nuclear plants and the balance of the state. In fact, the study notes that rates

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were lower or showed a sharper downward trend in the ‘nuclear’ counties. Although those differences are not significant, they are the opposite of what would be expected if a harmful exposure had occurred in these counties.

“What, therefore, to make of the allegations from Sternglass? The Health Department is somewhat gentle in dismissing his ‘methodological limitations and errors.’ But such nuclear fear mongering has real consequences. . . . Let this study by the Department of Health put to rest ill-founded fears raised to scare citizens into making costly, uninformed, short-term decisions.”

Minnesota Cancer Surveillance System report, “The Occurrence of Cancer in Minnesota 1988-1992: Incidence, Mortality and Trends,” submitted to the Minnesota Department of Health – Chronic Disease and Environmental Epidemiology, March 1995.

“This analysis was undertaken following allegations by several individuals and environmental groups in 1994 that significant increases in breast cancer mortality rates had occurred in counties close to the Prairie Island and Monticello nuclear power plants.

“The differences in rates in these counties and other ‘nuclear’ counties in Minnesota and throughout the U.S. were attributed to the operation of those plants.

“The Minnesota Department of Health attempted to replicate and expand those analyses using complete cancer mortality data for the period 1950 through 1992. No significant differences in trends in breast cancer mortality rates were detected for counties surrounding the Monticello or Prairie Island plants compared to the overall Minnesota average. Also, no significant differences were found for the rates of newly diagnosed breast cancers for the years 1988-1992, for which complete data are available from the Minnesota Cancer Surveillance System. No differences were found in mortality or incidence rates for cancers of the bone and thyroid gland or for leukemia—cancers for which ionizing radiation is an established risk factor.”

John Moulder, The Milwaukee Journal, Oct. 27, 1994.

“John Moulder, a radiation biologist at the Medical College of Wisconsin in Wauwatosa, said the Sternglass claim was ‘patently false. There has been no unexpected increase in cancer rates in the counties that have or are next to nuclear facilities, including Manitowoc and Kewaunee Counties,’ Moulder said.”

B. Kim Mortensen, The (Cleveland) Plain Dealer, Oct. 7, 1993.

“Nuclear power critic Ernest Sternglass boldly proclaimed in August that the Perry nuclear power plant caused an increase in low-birth-weight babies in

Lake, Geauga, Cuyahoga and Ashtabula counties. The Ohio Department of Health says it isn’t so.

“State officials reviewed Sternglass’ data and determined his methods were flawed. They found no evidence to support his claim that Perry caused a 40 percent rise in low-birth-weight babies in the four counties from 1986 through 1991.

“‘The rise is artificial. He created the rise,’ said Kim Mortensen, chief of the epidemiology and toxicology bureau. ‘If you look at what he did, he picked points, whether intentional or not, that made them go in the direction he wanted. Some would argue he produced the results he wanted.’”

William R. Hendlee, review of the book “Deadly Deceit: Low-Level Radiation, High-Level Cover-Up,” Journal of the Health Physics Society, December 1990, 59(6).

“Many of the allegations in this book have been discredited several times over. For example, the National Center for Health Statistics reports that the age-adjusted U.S. mortality rate actually dropped to an all-time low in 1986. The Connecticut Department of Public Health has been unable to identify any cancer increases near the Millstone facility, and the Pennsylvania Department of Health has detected no health effects other than psychological stress resulting from the Three Mile Island accident. But these con-

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clusions do not seem to deter the authors.”

Paul Meier, “Sly Statistics,” review of the book “Deadly Deceit: Low-Level Radiation, High-Level Cover-Up,” The Bulletin of the Atomic Scientists, September 1990.

“In essence, Sternglass followed an old and discredited style of epidemiological analysis, unsystematically selecting data sets and analyses that fit one’s thesis, and ignoring or explaining away other findings. Public health data are so rife with selection biases and other distortions that even the most experienced practitioners often go astray. Epidemiology is not a field for amateurs.”

David Carroll, letter to Governor’s Chesapeake Bay Coordinator, State of Maryland, Office of the Governor, Aug. 15, 1988.

“The correlation between infant mortality and radiation from Peach Bottom (nuclear power plant), which Dr. Sternglass asserts exists, is not supported by the information presented. A preliminary review of this information by several Maryland agencies indicates that this information does not merit a detailed review.

“I am also concerned that inaccurate information such as that presented by Dr. Sternglass is continually used to misinform the public, and to promote emotional, rather than rational, responses.”

Pennsylvania Department of Health, news release in response to Sternglass allegations, April 20, 1981.

“The state Health Department’s director of epidemiological research labeled a two-part magazine article written by nuclear-power opponent Dr. Sternglass as ‘highly inaccurate to the extent of creating unnecessary fear in the minds of Commonwealth Citizens.’

“Dr. Sternglass’ words have the potential of creating fear, apprehension, stress and even panic among the residents of central Pennsylvania. This is totally irresponsible, and the Department of Health regrets that the public has been subjected to such unfounded statements from Dr. Sternglass,’ Dr. George Tokuhata said.”

Michigan Department of Public Health, review of Sternglass paper, “Infant Mortality Changes Near the Big Rock Point Nuclear Power Stations, Charlevoix, Michigan,” February 1971.

“Sternglass’ papers have not been based on scientific tests, but rather on a statistical data evaluation of infant mortality rates and reactor-plant emissions, selecting and rejecting figures to arrive at an apparently biased conclusion.

“In his statistics, Sternglass lists 10 counties on a chart called ‘Adjacent Counties.’ What they are adjacent to is unknown, because if it refers to the Big Rock Point plant,

he is using Crawford, Kakaska, Benzie and Grand Traverse counties, all of which have a buffer county between them and the power plant. But only by using Grand Traverse County, 45 miles from the plant and approximately 180 degrees from the direction of the prevailing winds, is he able to make his point of a rise in the infant mortality during 1966-67. Grand Traverse County had a percentage increase of 44.5 during that period.

“Charlevoix, the county in which the plant is located, and Emmet County, directly east of the site and in line with the prevailing winds, had a decrease in infant mortality from 1966-67. Sternglass’ conclusion that the reactor plant has influence over the 10 counties is certainly questionable when the two closest counties show no effect and he is forced to use counties far to the south to buoy his figures.

“The ‘three independent tests’ [with which Dr. Sternglass claimed to have verified his data] were not tests at all, but other papers written by Dr. Sternglass using the same irresponsible method of interpreting and selecting figures to fit his conclusions.

“Based on the material used by Sternglass, there is no logical reason to conclude that there is a connection between infant mortality and radioactive effluent from the Big Rock Point reactor.”

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**Office of Radiological Health,
Pennsylvania Department of
Environmental Resources,
summary statement on
Sternglass allegations con-
cerning nuclear power and
infant mortality, Feb. 8, 1971.**

“It appears that Dr. Sternglass, even using selected data to fit his theories, has not proven that any relationship exists between the proximity to nuclear facilities in Pennsylvania and infant mortality rates.”

**Committee on Environmental
Hazards, American Academy
of Pediatrics, April 15, 1970.**

“Significant time and energy have been devoted to evaluating the papers and conclusions of Dr. Sternglass. Evaluation of the data has convinced the committee that his conclusions are completely unfounded and unsubstantiated. The Sternglass hypothesis can be criticized for these reasons:

- “He has selected data to prepare his hypothesis without considering the far more extensive data that do not support it. In particular, his conclusions conflict with the results of a sophisticated study concerning the offspring of atomic-bomb survivors in Hiroshima and Nagasaki.
- “Several assumptions on which Sternglass’ hypothesis rests have been shown to be erroneous.
- “He has misinterpreted some information in seeking support

for his thesis from other studies.

- “Animal experiments concerned with chronic irradiation delivered at a much higher dose rate than that delivered by fallout radiation, and in some instances for many generations, do not increase fetal or infant mortality.”

“Dr. Sternglass’ concern about nuclear warfare and fallout is shared by all. By misinterpreting the available data and subjecting himself and science in general to ridicule or suspicion, he may inadvertently be hampering the attainment of some of the goals he considers important. The committee shared his concern but not his methodology or conclusions.”

**Peter Greenwald, M.D.,
Director, Cancer Control
Bureau, and Sandra Kinch,
Director, Health Statistics,
New York State Department
of Health, “Is There Evidence
for an Association of
Radioactive Fallout to Leu-
kemia and Fetal Mortality in
New York State?” (n.d.)**

“Doctor E. J. Sternglass has presented evidence purporting to show a relationship of radioactive fallout to leukemia and fetal mortality. Crucial to his analysis are the leukemia and fetal mortality trends in the Albany-Schenectady-Rensselaer county area of New York state during the 1950s.

“Using ‘Vital Statistics’ and State Cancer Registry data, the New York State Department of

Health has analyzed the Sternglass report and the data upon which it is based.

The results of our analyses tend to refute the validity and the conclusion of the Sternglass report. We, therefore, can find no evidence for a relationship of fallout to leukemia in Albany, Schenectady or Rensselaer counties.”

This fact sheet also is available at www.nei.org.